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(NINTH) AWARD OF THE DONOHOE COMET-MEDAL.

The Comet-Medal of the Astronomical Society of the Pacific, has been awarded to W. F. DENNING, Esq., F. R. A. S., of Bristol, England, for his discovery of an unexpected comet on March 18.

The Committee on the Comet-Medal,

EDWARD S. HOLDEN,
J. M. SCHAEBERLE,
CHAS. BURCKHALTER.

May 18, 1892.

A HANDBOOK OF PRACTICAL ASTRONOMY FOR UNIVERSITY STUDENTS AND ENGINEERS.

By W. W. CAMPBELL, Ann Arbor, 1891, 8vo, 166 + iii pp.

[Reviewed by Prof. J. E. KEELER, Director of the Allegheny Observatory.]

For an undergraduate course of instruction in practical astronomy the larger and complete works of CHAUVENET and others are much too elaborate, as their thorough reading would require more time than can usually be allotted to the subject of astronomy. It is the usual practice of the teacher to omit certain portions of the text-book, and no doubt the result is fairly satisfactory, but a course arrived at by such a process of exclusion is necessarily inferior in logical coherence to one specially prepared in accordance with a systematic plan. In the latter case the student is not embarassed by frequent references to matter in omitted chapters, formulae required in practice are readily found, —and other advantages will readily suggest themselves.

Mr. CAMPBELL'S book contains an abridged course in practical astronomy which is admirably adapted to the requirements of the undergraduate student who wishes a general preparation for further and more special work, and to those of students of civil engineering, who desire a complete treatment of certain practical problems. The instruments and methods in common use in observatories are fully explained, while special instruments like the heliometer, and unusual methods of observation with ordinary instruments, are omitted. The instruments selected for

a sufficiently complete treatment are the sextant, transit, zenith telescope, and equatorial, with the minor appliances used in connection with them. The meridian circle is omitted, probably on account of the considerable amount of space it would require.

The essential formulae of spherical astronomy are developed in the first five chapters. In mathematical treatment, CHAUVENET and other standard authorities are generally followed, and their familiar notation is retained, which is an excellent feature of the book. Numerous examples are given in illustration, mostly from observations made at the Detroit Observatory. It is to be especially remarked that constant reference is made to the Nautical Almanac so that the student, after completing his course, should be perfectly familiar with it uses.

A chapter on the surveyor's transit considered as an altitude and azimuth instrument for astronomical work will be very useful to surveyors and engineers, as it shows how to determine azimuths, latitude, and time to within the least angle that can be read on the graduated circles of the instrument.

Among the novelties which have hitherto not found their way into text-books, we notice SCHAEBERLE'S method of adjusting the polar axis of an equatorial. For large instruments, in particular, this method is simpler and more convenient in its application than the usual one. The practical character of the book as a guide to the student in the art of observation is shown by the attention paid to minor details of methods, which the beginner is apt to regard as unimportant, but in the observance of which really lies all the difference between good and indifferent work. A good point is made in avoiding negative readings in determining the index correction of a sextant, as they are a fruitful source of error to the inexperienced observer.

An appendix contains some valuable hints on computing, a collection of formulae for the adjustment of observations by the method of least squares, a short list of teloscopic objects, the Pulkowa refraction tables, and a table of reductions to the meridian and to elongation.

With the exception of a few geometrical diagrams, the book is not illustrated, but as it is intended to be used in the observatory, with the instruments themselves before the student, the lack of more elaborate figures will not be felt.